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RAPID COCAINIZATION.

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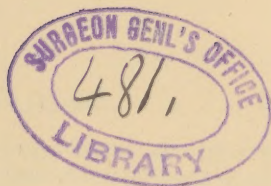
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RAPID COCAINIZATION.

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THE anæsthesia of the cornea and conjunctiva produced by the instillation of solutions of cocaine of varying strengths into the lower palpebral sac will undoubtedly be of value in ocular surgery and therapeutics, but to what extent it will replace the anæsthesia of ether remains for a longer use of the alkaloid to determine. The results thus far are very gratifying; and it is to be hoped that there will be no cause for disappointment on the part of the gentlemen who favor its introduction. Cocaine, an alkaloid obtained from the *Erythroxylon coca*, has been known since 1855, but its application to diseases and injuries of the eye is due to the investigations of a brilliant young German physician, Dr. Koller, of the Vienna General Hospital.

The following are cases occurring in the service of Dr. Henry W. Bradford at the Massachusetts Charitable Eye and Ear Infirmary, in which he has used cocaine from T. Metcalf & Co. for local anæsthesia.

CASE I. Male, aged twenty-five. Incised wound of the ciliary region with prolapse of the iris; right eye. Cocaine, two per cent. solution, the alkaloid having been rendered soluble by the addition of dilute hydrochloric acid. First instillation, one drop; end of third minute, cornea and conjunctiva somewhat anæsthetic, the sensibility being tested with the finger, a quill tooth-pick, blunt probes, and twisted linen cloth; end of fourth minute, one drop; end of sixth minute, cor-

nea entirely insensible to pain, the patient being unable to indicate the precise moment of contact; end of ninth minute, third drop; twelfth minute, operation; prolapsed portion of iris seized with forceps and snipped with scissors, the patient, according to his own statement, not feeling the slightest pain.

CASE II. Male, aged fifty-five. Traumatic ulcer of cornea with hypopion; right eye. Cocaine, two per cent. solution. Both corneæ found to possess the usual amount of sensitiveness when the tests enumerated under Case I. were applied. First instillation, one drop; end of second minute, anæsthesia commencing; end of fourth minute, one drop; end of ninth minute, complete anæsthesia of cornea; conjunctiva incomplete but considerable; twelfth minute, operation; paracentesis of the cornea with a Graefe knife. Upon the introduction of the iris-forceps to dilate the opening into the anterior chamber slight pain was complained of which was not experienced after placing a drop along the line of the incision. The usual pain due to evacuation of the aqueous was not noticed.

CASE III. Male, aged forty-three. Iridectomy for lamellar cataract; left eye. Cocaine, eight per cent. solution. First instillation, one drop; end of first minute, one drop; end of second minute, one drop; no pain upon applying the usual tests; end of fourth minute, patient did not know when the finger of the operator touched the cornea unless considerable pressure was made; end of fifth minute, stop speculum was inserted, and the ordinary operation of iridectomy performed without the patient being conscious of any pain. The hæmorrhage into the anterior chamber was hardly perceptible. This patient was considerably terrified at the prospect of an operation without ether, but appeared very much surprised that it had been completed so quickly, not realizing that anything had been done beyond making an examination.

CASE IV. Male, aged sixty. Needle operation for secondary cataract; left eye. Cocaine, eight per cent.

solution. First instillation, one drop; end of first minute, one drop; end of second minute, cornea anæsthetic to the before-mentioned tests; end of fourth minute, operation; cornea perforated by the needles, and the capsule ruptured. The patient, after the operation was completed, said that the discomfort he experienced was no greater than if some one had gently pulled a fold of skin on the back of his hand, and was surprised that an operation had been performed.

CASE V. Female, aged forty. Division of the internal rectus muscle for strabismus; right eye. Cocaine, eight per cent. solution. First instillation, one drop; end of first minute, one drop; end of second minute, cornea and conjunctiva anæsthetic to the usual tests; end of fourth minute, operation; stop speculum introduced; conjunctiva seized and divided. When the hook was placed under the tendon the patient resisted, and complained of pain. The hook was immediately removed, and a drop was placed near the muscle, after which the tendon was again drawn forward, and the muscle divided without much complaint. The resistance and complaint of the patient from her description of the sensations she had experienced during the operation seemed to be induced by the unaccustomed sensation caused by the speculum stretching the lids, and the traction on the muscle by the hook rather than by the acute pain usually felt by those who submit without an anæsthetic.

CASE VI. Male, aged thirty-four. Division of internal rectus muscle; left eye. Cocaine, eight per cent. solution. First instillation, one drop; end of first minute, one drop; end of second minute, conjunctiva seized with forceps, cut, and dissected up and one drop placed near the site of the muscle, which was then divided. The patient said the operation was in no wise painful; the stop speculum was used.

CASE VII. Female, aged forty-seven. Modified Graefe operation for cataract; right eye; cataract hypermature, duration seven years, projection and per-

ception normal. Cocaine eight per cent. solution, one drop instilled; at end of first minute, one drop; end of second minute, one drop, cornea anæsthetic to usual tests; end of third minute, the speculum introduced without the slightest resistance on the part of the patient, care, however, being taken not to stretch the canthi; at three and a half minutes after the first instillation the conjunctiva was seized and the cut made; at the end of fourth minute, one drop was placed upon the incision, and half a minute later the iris was seized, drawn out, and divided, the patient complaining of only a slight twinge of pain; the cystotome was used at the end of the fifth and the expulsion was completed by the end of the sixth minute, without loss of vitreous; rubbing on the cornea with the curette for the expression of the cortical substance was not felt; the speculum was removed before the end of the seventh minute. There was but little cortical, the nucleus being very large and firm; the delivery of the lens was delayed somewhat, owing to a wax-like rigidity of the surrounding tissues. The hæmorrhage from the iridectomy was very slight and transient, being in marked contrast to an iridectomy under ether. On examination with the oblique light a thickened and opaque capsule was seen. The patient wished to take ether, but was persuaded to submit to cocaine anæsthesia, and like the others expressed surprise at the absence of pain which marked the various steps of the operation.

CASE VIII. Male, aged twenty-three. Foreign body, cornea right eye. Cocaine, eight per cent. solution; three instillations and removal before the end of the third minute; no pain, though considerable force was used to dislodge the piece.

CASE IX. Male, aged thirty-nine. Transplantation of pterygium; right eye. Cocaine, eight per cent. solution; one drop instilled; at end of first minute cornea anæsthetic, but patient flinched when conjunctiva was seized with forceps; second drop was in-

stilled, and the operation completed during the third minute without pain.

CASE X. Male, aged thirty. Foreign body in cornea of left eye. Cocaine, eight per cent. solution; one drop instilled; removal during the second minute without pain.

CASE XI. Male, aged thirty-three. Foreign body in cornea of right eye. Cocaine, eight per cent. solution; one drop instilled, and removal effected during the third minute without pain. The time of operating in this case, as in several others, was delayed somewhat in order to give those who were present at the clinic an opportunity to test the completeness of the anæsthesia, which in foreign body cases is sufficient to permit the removal during the second minute, even though only one instillation has been made.

There have been thus far in this line of cases no bad results noticed; the patient mentioned in Case I., and who was operated upon October 25th, at nine P.M., passed a comfortable night, and his eye is none the worse for this anæsthetic. The patient mentioned under Case II. who underwent operation the same evening had some pain during the night, but the pus has not reappeared in the anterior chamber; Cases III. and IV. are presumably in as good a condition as they would have been if ether had been used; Cases V. and VI. were seen two days after the operation; there was no chemosis, and subconjunctival extravasation was absent; the wound had healed kindly, the only signs of operative interference being perhaps slight displacement of the edges of the incision, and a moderate injection of the blood-vessels.

Dr. Bradford's experience with the alkaloid, when placed in his own eye in the form of an eight per cent. solution, was as follows: First instillation of one drop; at end of the first minute considerable anæsthesia of the cornea; second instillation of one drop; at end of second minute complete anæsthesia of the cornea, and at end of fourth minute conjunctiva anæsthetic; end of sev-

enth minute slight diminution of anæsthesia of the cornea; end of eleventh minute anæsthesia of cornea and conjunctiva nearly gone; end of fifteenth minute anæsthesia totally abolished, and mydriasis commencing; there was no change in the accommodation noticed from this application.

On another occasion he instilled one drop of an eight per cent. solution at intervals of one minute, till eight drops had been used; end of first minute beginning anæsthesia of the cornea; end of second minute anæsthesia of cornea and conjunctiva; sensation of pain and contact with any of the objects used in testing abolished; a sense of pressure if considerable force was applied still noticed; up to the end of the tenth minute the sensation of pressure demanded a constant increase in force in order to be recognized; at this point the pressure sense was abolished; the medium for transmitting the force was a finger or a pen-holder; this state continued till the end of the sixteenth minute, when the pupil commenced to dilate, and there was a feeling of dryness about the eye. Anæsthesia of the conjunctiva commenced to pass away at the end of the twenty-first minute, and sensibility returned to the cornea with the thirty-third minute. The mydriasis was about two thirds and lasted over five hours. Accommodation was affected to the extent of $+1.5$ D. On this as on other occasions the cornea was affected first and recovered its sensibility last. The pressure, if considerable, caused a peculiar feeling of nausea.

The motive which impelled Dr. Bradford to have these cases collected, and to prepare this paper, was the hope that there might be a method of rapid cocainization, provided a sufficiently strong solution was used and the intervals between the successive instillations sufficiently short. By the experiments upon his own eyes he found that he could obtain a complete anæsthesia of his cornea by the end of the second minute when tested by the methods enumerated under Case I. The conjunctiva of the globe offered a greater resist-

ance than the cornea, not becoming anæsthetic till the end of the fourth minute. By referring to Cases III.—XI. inclusive, it will be noticed that the instillations are at intervals of one minute, with almost immediate anæsthesia as a result; the reason for selecting this interval was because in his own eye there was considerable anæsthesia by the end of a minute, showing that absorption was rapid, and by continuing the instillations frequently he hoped to increase the existing anæsthesia of the first drop by each additional instillation, thus reaching the point of saturation sooner. The time for operating was when the cornea and conjunctiva lost their sensibility, excepting in certain instances, when the operation was delayed in order to give the gentlemen who were present an opportunity to examine the condition of the eye.

Case III. Iridectomy, performed during the sixth minute.

Case IV. Secondary cataract, operation during fifth minute.

Case V. Strabismus, operation during fifth and sixth minutes.

Case VI. Strabismus, operation during third minute.

Case VII. Cataract, operation during fourth, fifth, and sixth minutes.

Case VIII. Foreign body removed during third minute.

Case IX. Pterygium, operation during third minute.

Case X. Foreign body removed during second minute.

Case XI. Foreign body removed during third minute.

From the foregoing it will be seen that it is possible to perform these operations within seven minutes from the time the first instillation is made, which is a matter of considerable importance at a large clinic, where time is of value, and this celerity contrasts favorably

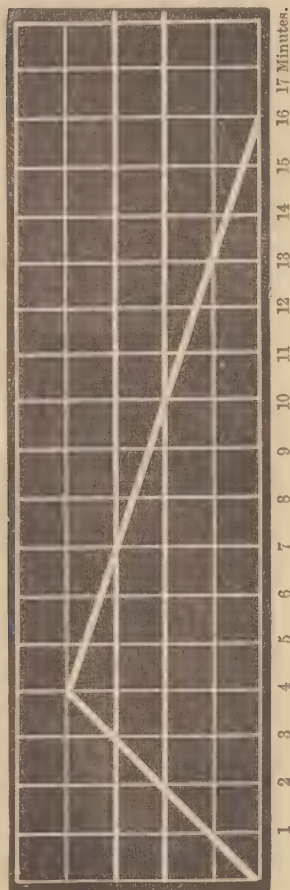
with the delays incident upon etherization, and it is of not less importance that we have at our command an anæsthetic which permits of the utilization of artificial light without danger to the patient, the electric light being inconvenient outside of an office or hospital.

The sort of cases for which cocaine seems to be especially adapted are operations about the cornea or conjunctiva; in the removal of foreign bodies imbedded in the cornea it will probably have its widest application. Bowman's operation can be performed without pain, and the passage of probes probably facilitated by the injection of a solution into the canal or by lubricating them with the alkaloid incorporated with a proper vehicle. For a thorough examination when blepharospasm is present it is certainly of practical value.

The operations for pterygium and strabismus can be performed with ease, but a local application beneath the conjunctiva is advisable in the latter. In the operation for cataract and iridectomy it is preferable to ether, because the hyperæmic condition which exists during ordinary etherization is avoided, and there is no danger of straining, coughing, and vomiting on the part of the patient, which so tends to increase the vascularity of the part, and to favor free hæmorrhage into the anterior chamber. The mydriasis, unaccompanied by any prolonged disturbance of the accommodation, is of course an advantage over that produced by the present mydriatics when used to aid in diagnosis with ophthalmoscope. In the treatment of iritis it will probably not supersede atropine, though in combination it would perhaps be of value in relieving the nocturnal pain. In cases requiring long operative interference cocaine has a practical application from the fact that Dr. Bradford found it possible to maintain a continued anæsthesia for several hours.

ANÆSTHESIA OF CORNEA.
Commences second minute.
Ends tenth minute.

ANÆSTHESIA OF CONJUNCTIVA.
Commences third minute.
Ends seventh minute.



Conjunctival
Anaesthesia.
Corneal
Anaesthesia.

Diagram, illustrating the duration of conjunctival and corneal anaesthesia, produced by the instillation of a single drop of Cocaine Hydrochlorate. (Saturated solution.)

CASE XII. Male, capsular cataract, left eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute one drop; end of two and one half minutes, speculum inserted; end of third minute, cornea perforated by needles, capsule torn; end of three and one half minutes, speculum removed.

CASE XIII. Male, senile cataract, right eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute, one drop; end of two and one half minutes, speculum; end of two and three quarter minutes, conjunctiva seized; end of three and one quarter minutes, Graefe cut made; end of three and three quarter minutes, iridectomy; end of four and one half minutes, cystotome; end of five and one quarter minutes, lens removed; end of six and one half minutes, speculum removed; end of seven minutes, counts fingers.

CASE XIV. Male, iridectomy, right eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute, one drop; end of two and one quarter minutes, speculum; end of two and three quarter minutes, Graefe cut completed; end of three and one quarter minutes, iridectomy completed; end of three and one half minutes, speculum out.

CASE XV. Male, senile cataract, left eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute, one drop; end of two and three quarter minutes, speculum; end of three and one half minutes, Graefe cut made; end of four and one quarter minutes, iridectomy made; end of four and one half minutes, cystotome; end of four and three quarter minutes; lens removed; end of fifth minute, speculum removed and counted fingers.

CASE XVI. Female, traumatic cataract, right eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second

minute, one drop ; end of third minute, one drop ; end of fourth minute, cut completed with Graefe knife ; end of fifth minute, lens material out and speculum removed.

CASE XVII. Male, cretaceous capsular cataract, right eye. Cocaine eight per cent. solution ; first instillation, one drop ; end of first minute, one drop ; end of second minute, one drop ; end of three and one half minutes, speculum ; end of fourth minute, capsule transfixed with a Bowman's needle ; end of four and one half minutes, crochet needle used to break the capsule ; end of sixth minute, one drop ; end of seventh minute, corneal cut with Graefe knife ; end of tenth minute, cut enlarged ; end of eleven and one half minutes, fragments seized with forceps and drawn out ; end of twelfth minute, operation completed.

CASE XVIII. Male, preliminary iridectomy, left eye. Cocaine eight per cent. solution ; first instillation, one drop ; end of first minute, one drop ; end of second minute, one drop ; end of two and three quarter minutes, speculum ; end of three and one quarter minutes, corneal cut made ; end of three and one half minutes, iridectomy completed ; end of four and one half minutes, speculum removed.

CASE XIX. Male, Morgagnian cataract, right eye. Cocaine eight per cent. solution ; first instillation, one drop ; end of first minute, one drop ; end of second minute, one drop ; end of third minute, Graefe cut completed ; end of fourth minute, vitreous ; end of four and one quarter minutes, one drop ; end of five and one half minutes, iridectomy completed ; end of sixth minute, lens had been removed by the scoop ; end of six and one half minutes, operation completed.

CASE XX. Female, strabismus, right eye. Cocaine eight per cent. solution ; first instillation, one drop ; end of first minute, one drop ; end of second minute, one drop ; end of two and one quarter minutes, speculum ; end of two and three quarter minutes, conjunctiva cut and dissected up, traction on muscle

causes pain; end of three and one quarter minutes, one drop placed on the site of the muscle; end of fifth minute, tendon divided; end of sixth minute, speculum out.

CASE XXI. Male, pterygium, right eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of one and three quarter minutes, speculum; end of two and three quarter minutes, conjunctiva dissected up and suture introduced; end of three and one quarter minutes, speculum out.

CASE XXII. Female, strabismus, left eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute, one drop; end of two and one half minutes, speculum; end of three minutes, conjunctiva cut and one drop on site of muscle; end of fifth minute, tendon divided and speculum out.

When traction was exerted on muscle patient complained of headache, which ceased immediately when hook was removed.

CASE XXIII. Male, peritomy, left eye. Cocaine eight per cent. solution; first instillation, one drop; end of first minute, one drop; end of second minute, one drop; end of two and one quarter minutes, speculum; end of three minutes, corneal cut completed; end of five minutes, conjunctival cut completed; end of five and one quarter minutes, speculum out.

CASE XXIV. Infant, congenital cataract left eye. Cocaine eight per cent. solution; first instillation, one drop.

The speculum introduced and the operation of dissection performed; time not taken.

